Word Stress in Speech Production by L2 English Learners

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Abstract

The present paper reports on a preliminary study on L2 English learners' knowledge on stress assignment for derived words, focusing on their oral production. Drawing on pronunciation data from a group of Japanese EFL learners, this study examines the following aspects of the acquisition of the form part of the lexicon: (1) learners' overall performance on word stress in speech production, (2) the effects of suffix types on the learners' performance, (3) the relevance of L2 listening proficiency to word stress production, and (4) recurring errors. The present exploration is focused on the participants' performance on orally producing primary-stressed syllables.

Key words: word stress, L2 English learner, production, suffix type

1 Introduction

Language use, i.e., perception, comprehension and production, involves a number of interactions between the systems of one's linguistic knowledge in terms of syntax, semantics, and phonology/phonetics. Among them, the role of the lexicon, i.e. one's storage of lexical items, is of great interest. As such, we have witnessed increased interest in the role and organization of vocabulary in the fields of linguistics, psycholinguistics, natural language processing, and first as well as second language acquisition studies (Handke, 1995; Brent, 1997; Aitchison, 2003; Levelt, 1989; Wolter, 2001; Zoccolotti, P., De Luca, M., Di Filippo, G., Judica, A., & Martelli, M. 2008). In second language acquisition/learning studies, there are a number of issues concerning the way in which words are organized and understood. Archibald (1998: 6), for example, points out that "[a]n important goal of L2 research is to integrate the study of competence (linguistic knowledge) and performance (actual language use in particular situations)." The acquisition of procedural knowledge on word stress placement is one of them. Reading and listening are cognitive processes implemented through different input modes; therefore, they are considered to share nearly the same set of operations in the comprehension processes after the perception processes take place (Kadota, 2007: 77). There are studies that argue that prosodic information exerts a greater impact on comprehension than segmental information does in listening and the orthographical information of words and sentences, which the reader perceives visually, is turned into phonological representations in reading.

Linguistic stress is considered a mental phenomenon (Tzakosta, 2004: 39). It is not surprising

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that realizations of word stress are closely connected with more than a single component of one's linguistic competence. L1 speakers of English, who have little difficulty telling which syllables are to be pronounced with emphasis, are considered to possess implicit knowledge on word stress. This type of knowledge arguably dictates the way in which given linguistic properties are formed into an output representation. Linguistic studies have shown that locations of word stress by and large can be predicted by rule. In the context of acquisition of L2 phonology, however, "few studies have systematically examined how L2 suprasegmentals are learned or have identified what factors influence their learning" (Trofimovich and Baker, 2006: 2).

Jian (2000), based on Levelt's (1989) proposal on word structure, argues that though it is not possible to study representation and processes independently of each other, little attention was paid to issues of representation. The information of a word, or the knowledge a language user possesses about the word, is considered to be multifaceted, with the components of grammatical competence interrelated with each other to form a single entity (Jian, 2000: 48). Figure 1 below, cited in Jian (2000), is an illustration of the components of a lexical entry Levelt (1989: 182) proposes:

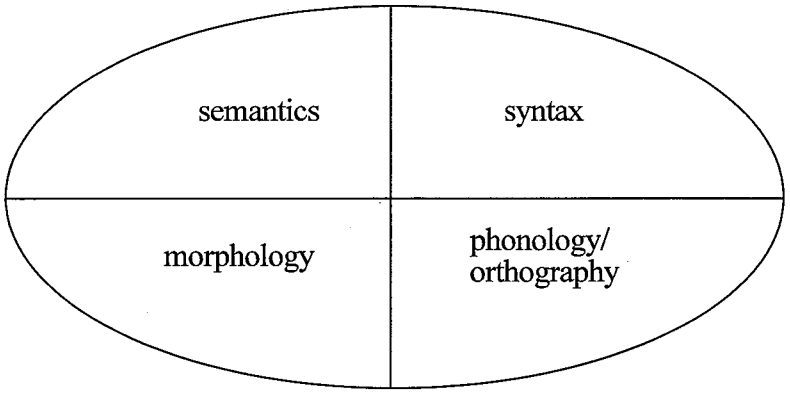

Figure 1: The internal structure of a lexical entry

Jian (2000) proposes a model of how L2 lexical competence develops from the initial L1 stage to the complete L2 stage. It should be noted that lexical knowledge and lexical competence differ in that the former "is represented outside the lexical entry" and the latter exists "within the lexical entry" (Jian, 2000: 66). Being outside the lexical entry means that the explicit knowledge one possesses for a given word is stored independently of the procedural knowledge (competence) over which one has control. Jian (2000) further suggests that the application of lexical knowledge requires a certain level of conscious awareness while lexical competence, which is procedural, is executed automatically, i.e. with no consciousness required.

With the above-mentioned backdrop, the present paper reports on a preliminary study on L2 English learners' knowledge on stress assignment for derived words in light of their oral production. Particular attention is paid to placement of primary stress. Drawing on pronunciation data from a group of Japanese EFL learners, this study examines the following aspects of the

acquisition of the form part of the lexicon: (1) learners' overall performance on word stress in speech production, (2) the effects of suffix types, (3) the relevance of L2 listening proficiency to word stress production, and (4) recurring error patterns.

2 Data Collection

2.1 Participants

The participants for the present study were 22 Japanese students learning English as a foreign language at a university in Japan. They were 21 second-year students and one third-year student enrolled in an English listening course in the first semester (April-July) of the year 2005. The participants were divided into two proficiency groups based on their scores on a 15-minute listening gap-filling test. The test, developed from a *Voice of America Special English* news article on a cloze test creating program, asked the participants to listen to the accompanying audio file and write in the words missing from the script from which every five word had been deleted. The participants worked on the test using a playback software at a computer-assisted language laboratory. This procedure resulted in a mean score of 65.31, which was employed to divide the participants into two groups. Each group consisted of 11 participants. Table 1 shows the descriptive statistics of the results. The Student *t*-test (two-tailed) showed the difference between the mean scores from the two groups. The result confirmed that the difference was statistically significant at $p<.01$.

Table 1: The subject groups

Groups	*N*	*M*	*SD*	*t*
Upper	11	73.00	8.35	8.81**
Lower	11	57.64	5.52	
All	22	65.31	10.47	

Note: ** $p<.01$

2.2 Material

The present study used a total of 190 items composed of a set of 95 words and another set of 95 words derived by suffixation from the first set. These sets were formed so as to exclude possibilities of unknown items (bases forms as well as derived forms) being presented to the participants. The derived words were selected with the intention of securing some richness in the variety of suffixes and in word length (number of syllables). To this end, the Longman Defining Vocabulary (LDV), which provides approximately 2,200 basic words for learners of English, was employed. Of the 95 derived forms, 42 were based on a rhythmic, i.e. stress-changing, suffix and 53 on a stress-neutral suffix.[1]

2.3 Procedure

The participants were instructed to record themselves reading aloud the base-derivative pairs

[1] Note that not all the words with a stress-changing suffix always trigger stress shift in given environments. There are of course a number of cases in which a primary stress falls on the same syllable in the derived word as in the base word as a result of a normal application of relevant stress assignment rules. E.g. *pérson→pérsonal* vs. *índustry→indústrial.*

in the list in the designated order. The recording was made in the CALL room using the same speech analysis software at a sampling rate of 16 kHz. The recorded speech sounds were then saved in a storage medium in the WAV format. The present analysis focused on the participants' performance on primary-stress placement. The recordings were played and checked repeatedly to confirm the actual locus of the primary-stressed syllable in each derived word by looking at visual waveform patterns. As a result, a corpus of 2,112 samples was obtained. During the said listening course, no additional training was provided on specific areas in English pronunciation except for having the participants continue to work on the weekly assignments.

3 Findings

3.1 Overview

For each of the 95 words, the rate of correct production was obtained by dividing the total number of correct productions by the number of participants. Table 2 presents the descriptive statistics of the correct productions of primary stress the participants produced.

Table 2: The descriptive statistics of correct productions (primary stress)

# of correct productions	95
M	.89
SD	.19

In addition, Figure 2 shows the distribution of the collected productions. Of the 95 derivations, 48 items were handled without fault (1.00), accounting for more than half of the entire sample set. Thirteen items were produced at an accuracy rate of .96 and nine items at .91. For the rest of the words, the participants produced rates below the mean score of .89: five items at .87, six items at .83, four items at .74, and six items at .70. The item at an accuracy rate below .65 exhibited a single occurrence.

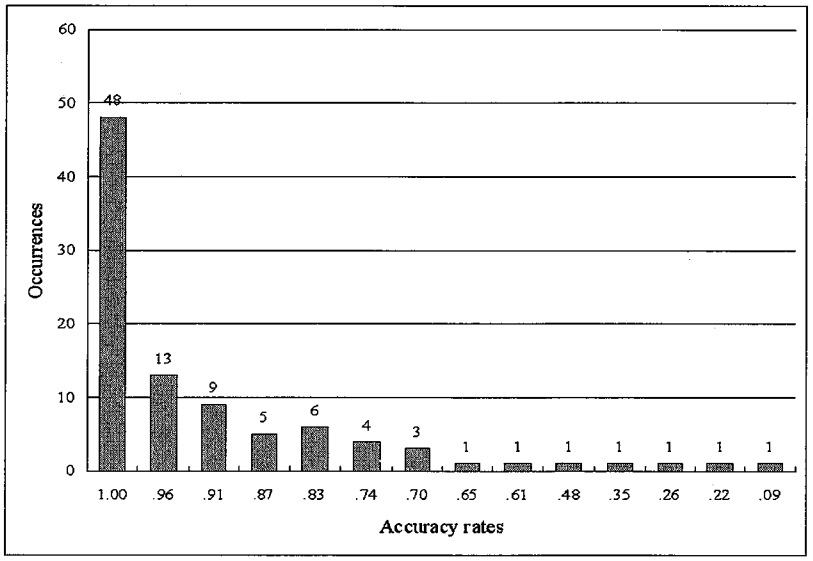

Figure 2 : The distribution of the words according to their rates of correct stress assignment

The results suggest that some words may be intrinsically more difficult than others for learners to produce, independently of their proficiency levels and the familiarity they possess about the given words. We will return to this issue later in the discussion of erroneous productions.

3.2 Listening proficiency and production of word stress

This section explores relations between the participants' proficiency in listening for forms and their ability to produce word stress. As stated above, the participants were streamed into two groups based on their scores on the listening cloze test. Table 3 shows the rates of correct productions sampled from the two subject groups. The higher listening proficiency group revealed a higher level of production than the lower listening proficiency group did. The mean rate and standard deviation from the upper group were .91 and .18. Those from the lower group resulted in .87 and .22. The difference between the two groups was examined with the Student *t*-test. The results confirmed that the difference was statistically significant at $p<.01$.

Table 3: Correct production rates from the two subject groups (N=95)

Subject group	*M*	*SD*	*t*
Upper	.91	.18	3.53**
Lower	.87	.22	

Note: **$p<.01$

The data in Table 4 show the distribution of the 95 items in terms of the degree to which productions of word stress were made correctly.

Table 4: The distribution of correct productions (N=95)

	Upper		Lower	
Range	# of items	Rate	# of items	Rate
A (≥ .80)	84	.88	78	.82
B (≥ .60)	6	.06	9	.10
C (≥ .40)	2	.02	4	.04
D (< .40)	3	.03	4	.04
Total	95	1.00	95	1.00

The upper proficiency group produced 84 items for Range A, six items for Range B, two items for Range C, and three items for Range D, while the lower proficiency group produced 78 items for Range A, nine items for Range B, four items for Ranges C and D, respectively. In regard to Range A, the upper proficiency group exhibited a greater score than the lower proficiency group; accordingly, the numbers of items for the remaining ranges are greater in the lower proficiency group than in the upper proficiency group. It seems natural to expect this kind of difference to trigger a greater number of degenerate representations of secondary stress among learners with lower L2 listening proficiency.

3.3 Rhythmic suffixes *vs.* neutral suffixes

The next issue is to find out whether learners' performance on word stress production can be affected by different suffix types. Recall that the 95 words were made up of 42 rhythmic derivations and 53 neutral derivations. The mean score and standard deviation that the participants produced were .87 and .03 for the rhythmic derivations, and the mean score and standard deviation which they produced for the neutral derivations were .92 and .02, respectively. Welch's *t*-test did not show statistical significance.

Table 5: The two suffix groups

Suffix type	Mean accuracy rate	*SD*	*t*
Rhythmic	.87	.03	1.23 *n.s.*
Neutral	.92	.02	

Note: *n.s.*=not significant

A further exploration was made on how rhythmic suffixes and neutral suffixes were treated in the two subject groups. The data in Tables 6 and 7 each show the results from the upper proficiency group and the lower proficiency group. For both learner groups, the neutral derivation set revealed higher accuracy rates than the rhythmic derivation set. In particular, the accuracy rate of the lower proficiency group for the rhythmic derivations was evidently low (.19), and its standard deviation (.22) addressed the greatest variance amongst the four sources although the Student *t*-test did not confirm that those differences were statistically significant at $p<.05$.

Table 6 : Comparison of rhythmic derivations vs. neutral derivations (within the upper proficiency group)

Suffix type	Mean accuracy rate	*SD*	*t*
Rhythmic	.91	.19	.72 *n.s.*
Neutral	.93	.15	

Table 7 : Comparison of rhythmic derivations vs. neutral derivations (within the lower proficiency group)

Suffix types	Mean accuracy rate	*SD*	*t*
Rhythmic	.86	.22	.84 *n.s.*
Neutral	.90	.19	

3.4 Error analysis

This subsection provides an in-depth analysis of the tokens sampled from the participants in order to find out what factors are involved in their determination of stress assignment for complex words. A particular emphasis is placed on how production errors are distributed across the sample set. First, we consider the cases in which a primary stress is to fall on the initial syllable in their legitimate surface forms. Table 8 summarizes the occurrences of the possible combinations in the data from the two learner groups.

Table 8: The distribution of realizations (primary stress on the initial syllable)

			Patterns		
Upper	1→1(correct)	1→2	1→3	1→4	Total
# of tokens	396	31	13	0	440
Rate	.90	.07	.03	.00	1.00
Lower	1→1(correct)	1→2	1→3	1→4	Total
# of tokens	379	44	17	0	440
Rate	.86	.10	.04	.00	1.00

Note that the upper proficiency group achieved an accuracy rate of .90; the lower proficiency group achieved an accuracy rate of .86. The erroneous tokens totaled 44 in the data from the upper proficiency group and 61 in the data from the lower proficiency group. We instantly notice that most of the erroneous realizations of primary stress belonged to the pattern '1→2', which exhibited a greater number of instances in the lower group's data than in the upper group's data. The reverse tendency is reflected in the difference between the two groups concerning the accurate pattern '1→1'.

Tables 9 and 10 below present the results from the two learner groups. They address 40 erroneously produced items, of which 5 are those which have been derived by a rhythmic suffix and 35 are those which have been derived by a neutral suffix. Thus, we see that most of the derivations with their primary stress on their initial syllables are composed of a monosyllabic base or a disyllabic or trisyllabic base with trochaic rhythm.

We further examine differences between the upper proficiency group and lower proficiency group in regard to the distribution of actual tokens. As the most salient feature, it should be pointed out that most erroneous tokens were shared by the two learner groups. In each learner group, the pattern '1→2' shows the greatest frequency. Typical erroneous instances are represented by such items as *northérn, childhóod, rel[é ɪ]tive,* and *loyál[ɪ]ty.* As for the pattern '1→3', *difficúlty* and *specialíst* are particularly striking items with a greater number of errors.

Table 9 : The distribution of tokens (the upper proficiency group)

The syllable that carries primary stress	# of correct productions	1st syllable	2nd syllable	3rd syllable	4th syllable	Accuracy rate	Derivation	Suffix type[2]
1st	11	11	0			1.00	*careful*	n
1st	11	11	0			1.00	*careless*	n
1st	11	11	0			1.00	*cheerful*	n
1st	11	11	0	0		1.00	*criminal*	r
1st	11	11	0	0		1.00	*dangerous*	n
1st	11	11	0			1.00	*failure*	n

[2] The symbols 'n' and 'r' stand for 'neutral' and 'rhythmic', respectively.

1st	11	11	0			1.00	*faithful*	n
1st	11	11	0			1.00	*famous*	n
1st	11	11	0	0	0	1.00	*fashionable*	n
1st	11	11	0			1.00	*foolish*	n
1st	11	11	0			1.00	*formal*	r
1st	11	11	0			1.00	*friendly*	n
1st	11	11	0			1.00	*harmful*	n
1st	11	11	0			1.00	*hatred*	n
1st	11	11	0			1.00	*healthy*	n
1st	11	11	0			1.00	*helpful*	n
1st	11	11	0			1.00	*judgment*	n
1st	11	11	0			1.00	*kingdom*	n
1st	11	11	0			1.00	*peaceful*	n
1st	11	11	0	0		1.00	*personal*	r
1st	11	11	0	0		1.00	*powerful*	n
1st	11	11	0	0		1.00	*pressure*	n
1st	11	11	0	0	0	1.00	*reasonable*	n
1st	11	11	0			1.00	*servant*	n
1st	11	11	0			1.00	*sticky*	n
1st	11	11	0			1.00	*tourist*	n
1st	10	10	1	0	0	.91	*comfortable*	n
1st	10	10	0	1	0	.91	*honorable*	n
1st	10	10	1	0		.91	*manager*	n
1st	10	10	1	0		.91	*punishment*	n
1st	10	10	1			.91	*southern*	n
1st	9	9	1	1	0	.82	*favorable*	n
1st	9	9	2			.82	*northern*	n
1st	8	8	3			.73	*childhood*	n
1st	8	8	2	1		.73	*opposite*	r
1st	8	8	3	0		.73	*recently*	n
1st	7	7	0	4		.64	*specialist*	n
1st	5	5	0	6	0	.45	*difficulty*	n
1st	3	3	8	0		.27	*loyalty*	n
1st	3	3	8	0		.27	*relative*	r

Table 10: The distribution of tokens (the lower proficiency group)

The syllable that carries primary stress	# of correct productions	1st syllable	2nd syllable	3rd syllable	4th syllable	Accuracy rate	Derivation	Suffix type
1st	11	11	0			1.00	*careful*	n
1st	11	11	0			1.00	*careless*	n
1st	11	11	0			1.00	*cheerful*	n
1st	11	11	0	0		1.00	*criminal*	r
1st	11	11	0	0		1.00	*dangerous*	n
1st	11	11	0			1.00	*failure*	n
1st	11	11	0			1.00	*faithful*	n
1st	11	11	0			1.00	*famous*	n
1st	11	11	0	0	0	1.00	*fashionable*	n
1st	11	11	0			1.00	*foolish*	n
1st	11	11	0			1.00	*formal*	r
1st	11	11	0			1.00	*friendly*	n
1st	11	11	0			1.00	*harmful*	n
1st	11	11	0			1.00	*hatred*	n
1st	11	11	0			1.00	*healthy*	n
1st	11	11	0			1.00	*helpful*	n
1st	11	11	0			1.00	*judgment*	n
1st	11	11	0			1.00	*kingdom*	n
1st	11	11	0			1.00	*peaceful*	n
1st	11	11	0	0		1.00	*personal*	r
1st	11	11	0	0		1.00	*powerful*	n
1st	11	11	0	0	0	1.00	*reasonable*	n
1st	11	11	0			1.00	*servant*	n
1st	11	11	0			1.00	*sticky*	n
1st	11	11	0			1.00	*tourist*	n
1st	10	10	1			.91	*childhood*	n
1st	10	10	1	0		.91	*recently*	n
1st	9	9	1	1	0	.82	*favorable*	n
1st	9	9	2	0		.82	*manager*	n
1st	9	9	2			.82	*pressure*	n
1st	8	8	0	3	0	.73	*honorable*	n
1st	8	8	3			.73	*southern*	n
1st	8	8	0	3		.73	*specialist*	n
1st	7	7	4			.64	*northern*	n
1st	7	7	3	1		.64	*opposite*	r
1st	7	7	4	0		.64	*punishment*	n
1st	5	5	5	1	0	.45	*comfortable*	n

1st	3	3	1	7	0	.27	*difficulty*	n
1st	3	3	8	0		.27	*relative*	r
1st	1	1	9	1		.09	*loyalty*	n

The set of derivations with their primary stress on the second syllable contains 35 items, of which 19 are derived by attaching a rhythmic suffix and 16 are derived by attaching a neutral suffix. The numbers of accurate productions were 363 in the upper proficiency group at .94 and 355 in the lower proficiency group at .92. These word groups showed higher scores than those with a primary stress on the initial syllable as we reviewed above. This suggests that iambic rhythm patterns are easier to handle than trochaic rhythm patterns are, as this is in correspondence with the frequencies of these two types of rhythm. The sets of errors had 21 tokens (19 from the pattern '2→1' and three from the pattern '2→3') for the upper proficiency group and 26 tokens (22 from the pattern '2→1' and six from the pattern '2→3') for the lower proficiency group.

Table 11: The distribution of realizations (primary stress on the second syllable)

	Pattern				
Upper	2→1	2→2(correct)	2→3	2→4	Total
# of tokens	19	363	3	0	385
Rate	.05	.94	.01	.00	1.00
Lower	2→1	2→2(correct)	2→3	2→4	Total
# of tokens	22	355	6	0	385
Rate	.06	.92	.02	.00	1.00

A closer look at the data also reveals a number of important facts. Most of the errors from the upper proficiency group can be found in the set of errors from the lower proficiency group, the exceptions being *annoyance* and *industrial*. The rates of error production present some similarities. First, a large number of errors were incurred on *habitual* and *insurance*. Errors of reserving the original primary stress on the initial syllable in situ were clearly characteristic of *habitual* — its accuracy rates were .18 for the upper proficiency group and .00 for the lower proficiency group. Second, *insurance* gave rise to a number of errors with a primary stress on the initial syllable, appearing as **ínsurance*. Third, four errors were observed on *comparison* (two from the upper proficiency group and two from the lower proficiency group). They were produced with their third syllables being primary-stressed, i.e., the primary stress on the base form was not shifted in those erroneous instances.

Table 12: The distribution of tokens (the upper proficiency group)

The syllable that carries primary stress	# of correct productions	1st syllable	2nd syllable	3rd syllable	4th syllable	Accuracy rate	Derivation	Suffix type
2nd	11	0	11	0		1.00	*addition*	r
2nd	11	0	11	0		1.00	*appearance*	n
2nd	11	0	11	0		1.00	*approval*	r
2nd	11	0	11	0		1.00	*arrival*	r
2nd	11	0	11	0		1.00	*attendance*	n
2nd	11	0	11	0		1.00	*attractive*	r
2nd	11	0	11			1.00	*complaint*	n
2nd	11	0	11	0		1.00	*dependent*	n
2nd	11	0	11	0		1.00	*dismissal*	r
2nd	11	0	11	0		1.00	*effective*	r
2nd	11	0	11	0		1.00	*employment*	n
2nd	11	0	11	0		1.00	*enclosure*	n
2nd	11	0	11	0		1.00	*encouragement*	n
2nd	11	0	11	0	0	1.00	*establishment*	n
2nd	11	0	11	0		1.00	*existence*	n
2nd	11	0	11	0	0	1.00	*historical*	r
2nd	11	0	11	0		1.00	*improvement*	n
2nd	11	0	11	0		1.00	*infection*	r
2nd	11	0	11	0		1.00	*infectious*	n
2nd	11	0	11	0		1.00	*instruction*	r
2nd	11	0	11	0		1.00	*invention*	r
2nd	11	0	11	0		1.00	*permission*	r
2nd	11	0	11	0		1.00	*protection*	r
2nd	11	0	11	0		1.00	*refusal*	r
2nd	11	0	11	0		1.00	*sensation*	r
2nd	11	0	11	0		1.00	*successful*	n
2nd	11	0	11	0		1.00	*translation*	r
2nd	10	1	10	0		.91	*annoyance*	n
2nd	10	1	10	0	0	.91	*desirable*	n
2nd	10	1	10	0		.91	*musician*	r
2nd	9	2	9	0		.82	*arrangement*	n
2nd	9	0	9	2	0	.82	*comparison*	r
2nd	9	1	9	1	0	.82	*industrial*	r
2nd	7	4	7	0		.64	*insurance*	n
2nd	2	9	2	0		.18	*habitual*	r

Table 13: The distribution of tokens (the lower proficiency group)

The syllable that carries primary stress	# of correct productions	1st syllable	2nd syllable	3rd syllable	4th syllable	Accuracy rate	Derivation	Suffix type
2nd	11	0	11	0		1.00	*annoyance*	n
2nd	11	0	11	0		1.00	*approval*	r
2nd	11	0	11	0		1.00	*arrival*	r
2nd	11	0	11	0		1.00	*attendance*	n
2nd	11	0	11	0		1.00	*attractive*	r
2nd	11	0	11	0		1.00	*dependent*	n
2nd	11	0	11	0		1.00	*effective*	r
2nd	11	0	11	0		1.00	*enclosure*	n
2nd	11	0	11	0		1.00	*encouragement*	n
2nd	11	0	11	0		1.00	*existence*	n
2nd	11	0	11	0		1.00	*improvement*	n
2nd	11	0	11	0	0	1.00	*industrial*	r
2nd	11	0	11	0		1.00	*infection*	r
2nd	11	0	11	0		1.00	*infectious*	n
2nd	11	0	11	0		1.00	*instruction*	r
2nd	11	0	11	0		1.00	*invention*	r
2nd	11	0	11	0		1.00	*protection*	r
2nd	11	0	11	0		1.00	*refusal*	r
2nd	11	0	11	0		1.00	*translation*	r
2nd	10	1	10	0		.91	*addition*	r
2nd	10	1	10	0		.91	*appearance*	n
2nd	10	1	10	0		.91	*arrangement*	n
2nd	10	1	10			.91	*complaint*	n
2nd	10	0	10	1	0	.91	*desirable*	n
2nd	10	0	10	1		.91	*dismissal*	r
2nd	10	0	10	1		.91	*employment*	n
2nd	10	1	10	0	0	.91	*historical*	r
2nd	10	1	10	0		.91	*musician*	r
2nd	10	1	10	0		.91	*permission*	r
2nd	10	1	10	0		.91	*sensation*	r
2nd	10	1	10	0		.91	*successful*	n
2nd	9	0	9	2	0	.82	*comparison*	r
2nd	9	0	9	2	0	.82	*establishment*	n
2nd	8	2	8	1		.73	*insurance*	n
2nd	0	11	0	0		.00	*habitual*	r

Regarding the realizations of items with their primary stresses placed on their third syllables, greater variances in the participants' performance were observed in accordance with their listening proficiency. Although most of the accurate productions were attained in both learner groups (the upper proficiency group: .92; the lower proficiency group: .85), the difference between these two scores was far more evident than those from the other two sets of tokens we examined above. For the upper proficiency group, a total of 18 errors were collected — eight cases on the pattern '3→4', six cases on the pattern '3→2', and four cases on the pattern '3→1'. In contrast, the lower proficiency group showed its greatest frequency regarding the pattern '3→2'; its 24 occurrences resulted in a ratio of .12. This was followed by six occurrences of the pattern '3→4' and three occurrences of the pattern '3→1' in descending order.

Table 14: The distribution of realizations (primary stress on the third syllable)

	Pattern				
Upper	3→1	3→2	3→3(correct)	3→4	Total
# of tokens	4	6	201	8	219
Rate	.02	.03	.92	.04	1.00
Lower	3→1	3→2	3→3(correct)	3→4	Total
# of tokens	3	24	187	6	219
Rate	.01	.12	.85	.03	1.00

Tables 15 and 16 show the distributions of tokens in order of accuracy rate.

Table 15: The distribution of tokens (the upper proficiency group)

The syllable that carries primary stress	# of correct productions	1st syllable	2nd syllable	3rd syllable	4th syllable	Accuracy rate	Derivation	Suffix type
3rd	11	0	0	11	0	1.00	*admiration*	r
3rd	11	0	0	11	0	1.00	*association*	r
3rd	11	0	0	11	0	1.00	*combination*	r
3rd	11	0	0	11	0	1.00	*disappointment*	n
3rd	11	0	0	11	0	1.00	*entertainment*	n
3rd	11	0	0	11	0	1.00	*examination*	r
3rd	11	0	0	11	0	1.00	*explanation*	r
3rd	11	0	0	11	0	1.00	*invitation*	r
3rd	11	0	0	11	0	1.00	*operation*	r
3rd	11	0	0	11	0	1.00	*possibility*	r
3rd	10	0	1	10	0	.91	*declaration*	r
3rd	10	1	0	10	0	.91	*decoration*	r
3rd	10	0	0	10	1	.91	*determination*	r

3rd	10	0	0	10	1	.91	*electricity*	r
3rd	10	0	1	10	0	.91	*interruption*	r
3rd	10	0	1	10	0	.91	*preparation*	r
3rd	9	0	2	9	0	.82	*influential*	r
3rd	9	1	0	9	0	.82	*similarity*	r
3rd	8	2	1	8	0	.73	*probability*	r
3rd	5	0	0	5	6	.45	*representative*	r

Table 16 : The distribution of tokens (the lower proficiency group)

The syllable that carries primary stress	# of correct productions	1st syllable	2nd syllable	3rd syllable	4th syllable	Accuracy rate	Derivation	Suffix type
3rd	11	0	0	11	0	1.00	*association*	r
3rd	11	0	0	11	0	1.00	*disappointment*	n
3rd	11	0	0	11	0	1.00	*electricity*	r
3rd	11	0	0	11	0	1.00	*entertainment*	n
3rd	11	0	0	11	0	1.00	*examination*	r
3rd	11	0	0	11	0	1.00	*explanation*	r
3rd	11	0	0	11	0	1.00	*possibility*	r
3rd	11	0	0	11	0	1.00	*similarity*	r
3rd	10	0	1	10	0	.91	*decoration*	r
3rd	10	1	0	10	0	.91	*determination*	r
3rd	10	0	1	10	0	.91	*interruption*	r
3rd	10	0	1	10	0	.91	*invitation*	r
3rd	10	0	1	10	0	.91	*operation*	r
3rd	9	0	2	9	0	.82	*combination*	r
3rd	9	0	2	9	0	.82	*declaration*	r
3rd	8	0	3	8	0	.73	*admiration*	r
3rd	7	1	3	7	0	.64	*influential*	r
3rd	6	0	5	6	0	.55	*preparation*	r
3rd	5	1	5	5	0	.45	*probability*	r
3rd	5	0	0	5	6	.45	*representative*	r

These word groups each contain 20 rhythmic derivations and two neutral derivations. As was shown above, the upper proficiency group produced fewer errors and their overall results look fairly neat except for the six occurrences of *representative,* which carries its primary stress on the fourth syllable. In contrast, the errors which the lower proficiency group produced were mostly related to their second syllables as in *invite, combine, declare, admire,* and *prepare,* which serve as the bases for *invitation, combination, declaration, admiration,* and *preparation.* Note that all

of them carry a stressed tense vowel in their second syllables as indicated by underline. The illicit productions retained the locations of their original primary-stressed syllables and their segmental content.

In addition, **inflúential* and **probábility* show a stronger tendency to place a primary stress on the second syllable, with the primary-stressed syllables in the base forms *ínfluence* and *próbable* having been shifted. This seems to have much to do with the frequencies of stress patterns found in the English language. In order to confirm the frequencies of trochaic '1002' and '1020' and those of iambic '0100' and '0102' for quadrisyllabic words, a search of the Carnegie Mellon University Pronunciation Dictionary (CMUPD) was conducted. The results are provided in Table 17 for the trochaic patterns and in Table 18 for the iambic patterns.

Table 17 : Trochaic patterns in the CMUPD (quadisyllabic words)

Trochaic	Occurrences
1002	142
1020	1,730
Total	1,872

Table 18 : Iambic patterns in the CMUPD (quadrisyllabic words)

Iambic	Occurrences
0100	3,417
0102	548
Total	3,417

The data above evidently show that, in English, the iambic rhythmic patterns are nearly twice as frequent as the trochaic rhythmic patterns. The frequency with which learners get exposure to the target form (linguistic input) is considered undoubtedly far smaller in an EFL learning environment than in L1 learning environments, but it seems reasonable to assume that the relative frequencies between the two rhythmic patterns obtained from the database hold for both EFL and L1 acquisition. By extension, it seems that EFL learners fall back on iambic rhythm as a sort of ready-made template when they cannot work out the desired contour by any other means. It may be that the learners may reuse the information on the base word in other default cases.

4 Conclusion

Regarding the question of whether the learners' productions of derived words is sensitive to the two suffix types, the present study showed that neutral derivations are less subject to error than rhythmic suffixes but failed to secure statistical significance. The comparison of the productions from the two learner groups confirmed that the group with higher listening ability demonstrated better performance within each of the suffix types. The errors from the participants helped us to identify the status of their acquisition of the area under investigation—errors in stress contours from certain base forms to their derived forms seem persistent irrespective of the

learners' listening proficiency level. The present experiment also identified items that have greater error possibilities. This seems to result from specific combinations of segments in the given language (i.e. phonotactics). It was also shown that the acquisition of knowledge on word stress placement for derived words can be influenced by the frequencies of attested stress patterns; the growth of L2 listening proficiency provides landscaping for the growth of proficiency in producing the container of lemma information as part of vocabulary acquisition. Lastly, some limitations of the present study should be pointed out. First, the present research is still in its exploratory stage and requires further refinement with a larger number of subjects to draw an even more reliable picture of the status of Japanese EFL learners' acquisition of word stress. Second, subsequent to the present project, in which the stimuli for the experiment were based on words deemed familiar to the subjects as they were selected from the LDV, explorations should be conducted to examine the presence/absence of the effect of word familiarity and/or word frequency on EFL learners' production of word stress.

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